

# MATHEMATICS STANDARD ARTICULATED BY GRADE LEVEL

## GRADE 1

### Strand 1: Number Sense and Operations

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

#### Concept 1: Number Sense

Understand and apply numbers, ways of representing numbers, the relationships among numbers and different number systems.

- PO 1. Make a model to represent a given whole number 0 through 100.
- PO 2. Identify a whole number represented by a model with a word name and symbol 0 through 100.
- PO 3. Count aloud, forward or backward, in consecutive order (0 through 100).
- PO 4. Identify whole numbers through 100 in or out of order.
- PO 5. Write whole numbers through 100 in or out of order.
- PO 6. Construct equivalent forms of whole numbers, using manipulatives or symbols, through 99 (e.g.,  $15 + 5 = 10 + 10$ ).
- PO 7. State verbally whole numbers, through 100, using correct place value (e.g., A student will read 84 as eight tens and four ones.).
- PO 8. Construct models to represent place value concepts for the one's and ten's places.
- PO 9. Apply expanded notation to model place value through 99 (e.g.,  $37 = 3$  groups of ten + 7 units).
- PO 10. Identify odd and even whole numbers through 100.
- PO 11. Compare two whole numbers through 100.
- PO 12. Use ordinal numbers through tenth.
- PO 13. Order three or more whole numbers through 100 (least to greatest or greatest to least).
- PO 14. Make models that represent given fractions (halves).
- PO 15. Identify in symbols and in words a model that is divided into equal fractional parts (halves).
- PO 16. Identify money by name and value: penny, nickel, dime, quarter, and one dollar.
- PO 17. Count money through \$1.00 using coins.
- PO 18. Identify the value of a collection of coins using the symbols ¢ and \$.

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### Concept 2: Numerical Operations

Understand and apply numerical operations and their relationship to one another.

- PO 1. Demonstrate the process of addition through sums of 20 using manipulatives.
- PO 2. Demonstrate the process of subtraction with minuends of 20 using manipulatives.
- PO 3. State addition facts for sums through 18 and subtraction for differences with minuends through 9 or less.
- PO 4. Add one- and two-digit whole numbers without regrouping.
- PO 5. Subtract one- and two-digit whole numbers without regrouping.
- PO 6. Select the grade-level appropriate operation to solve word problems.
- PO 7. Solve word problems using addition and subtraction of 2-digit numbers without regrouping.
- PO 8. Count by multiples to show the process of multiplication (10s, 5s, or 2s).
- PO 9. Demonstrate families of equations for addition and subtraction through 18.
- PO 10. Demonstrate the identity and commutative properties of addition through 18.
- PO 11. Identify addition and subtraction as inverse operations.
- PO 12. Apply the symbols: +, -, =.
- PO 13. Use grade-level appropriate mathematical terminology.
- PO 14. Demonstrate addition of fractions with like denominators (halves) using models.
- PO 15. Demonstrate subtraction of fractions with like denominators (halves) using models.
- PO 16. Add and subtract money without regrouping using manipulatives and paper and pencil, through 99¢.

### Concept 3: Estimation

Use estimation strategies reasonably and fluently.

- PO 1. Solve problems using a variety of mental computations and reasonable estimation.
- PO 2. Estimate the measurement of an object using U.S. customary standard and non-standard units of measurement.

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### Strand 2: Data Analysis, Probability, and Discrete Mathematics

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#### Concept 1: Data Analysis (Statistics)

Understand and apply data collection, organization and representation to analyze and sort data.

- PO 1. Formulate questions to collect data in contextual situations.
- PO 2. Make a simple pictograph or tally chart with appropriate labels from organized data.
- PO 3. Interpret pictographs using terms such as most, least, equal, more than, less than, and greatest.
- PO 4. Answer questions about pictographs using terms such as most, least, equal, more than, less than, and greatest.
- PO 5. Formulate questions based on graphs, charts, and tables.
- PO 6. Solve problems using graphs, charts, and tables.

#### Concept 2: Probability

Understand and apply the basic concepts of probability.

*(Grades 2-HS)*

#### Concept 3: Discrete Mathematics – Systematic Listing and Counting

Understand and demonstrate the systematic listing and counting of possible outcomes.

- PO 1. Make arrangements that represent the number of combinations that can be formed by pairing items taken from 2 sets, using manipulatives (e.g., How many ice cream cones can one make with 2 different types of ice cream and 2 different types of cones?).

#### Concept 4: Vertex-Edge Graphs

Understand and apply vertex-edge graphs.

- PO 1. Color pictures with the least number of colors so that no common edges share the same color (increased complexity throughout grade levels).

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### Strand 3: Patterns, Algebra, and Functions

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#### Concept 1: Patterns

Identify patterns and apply pattern recognition to reason mathematically.

PO 1. Communicate a grade-level appropriate pattern (e.g., ♦, ▽, ♥ Repeat this complete pattern.)

PO 2. Extend a simple grade-level appropriate repetitive pattern (e.g., ↑, ↓, ↑, ↓, ↑, \_\_\_\_, \_\_\_\_, \_\_\_\_).

PO 3. Create grade-level appropriate patterns.

#### Concept 2: Functions and Relationships

Describe and model functions and their relationships.

(Grades 2-HS)

#### Concept 3: Algebraic Representations

Represent and analyze mathematical situations and structures using algebraic representations.

PO 1. Use variables in contextual situations.

PO 2. Find the missing sum or difference in number sentences for sums and minuends through 9  
(e.g.,  $2 + 5 = \_$ ).

#### Concept 4: Analysis of Change

Analyze change in a variable over time and in various contexts.

PO 1. Identify the change in a variable over time (e.g., an object gets taller, colder, heavier, etc.).

PO 2. Make simple predictions based on a variable (e.g., select next stage of plant growth).

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### Strand 4: Geometry and Measurement

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#### Concept 1: Geometric Properties

Analyze the attributes and properties of 2- and 3- dimensional shapes and develop mathematical arguments about their relationships.

- PO 1. Use the words vertex and side when describing simple 2-dimensional geometric shapes.
- PO 2. Identify 2-dimensional shapes by attribute (size, shape, number of sides, vertices).
- PO 3. Use concepts and terms of position and size in contextual situations:
- Inside/outside,
  - Left/right,
  - Above/below/between,
  - Smaller/larger, and
  - Longer/shorter.
- PO 4. Name common 2-dimensional shapes (square, rectangle, triangle, circle).
- PO 5. Draw 2-dimensional shapes (square, rectangle, triangle, circle).
- PO 6. Recognize where a line of symmetry divides a 2-dimensional shape into mirror images.

#### Concept 2: Transformation of Shapes

Apply spatial reasoning to create transformations and use symmetry to analyze mathematical situations.

- PO 1. Recognize same shape in different positions (slide/translations).

#### Concept 3: Coordinate Geometry

Specify and describe spatial relationships using coordinate geometry and other representational systems.

*(Grades 3-HS)*

#### Concept 4: Measurement - Units of Measure - Geometric Objects

Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements.

- PO 1. Compare the measurable characteristics of two objects (e.g., length, weight, size).

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PO 2. Select the appropriate measure of accuracy:

- length – inches, feet,
- capacity/volume – cups, gallons, and
- mass/weight – pounds.

PO 3. Tell time to the hour using analog and digital clocks.

PO 4. Name the days of the week for yesterday, today, and tomorrow (e.g., If today is Wednesday, what day will it be tomorrow?).

PO 5. Name the 12 months of the year in proper order, starting with January.

PO 6. Name the 7 days of the week in proper order, starting with Sunday.

PO 7. Measure a given object using the appropriate unit of measure:

- length – inches, feet and yards,
- capacity/volume – cups, gallons, and
- mass/weight – pounds.

### Strand 5: Structure and Logic

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#### Concept 1: Algorithms and Algorithmic Thinking

Use reasoning to solve mathematical problems in contextual situations.

PO 1. Create problems based on contextual situations (addition facts up to 18 and subtraction from 9).

#### Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof

Evaluate situations, select problem-solving strategies, draw logical conclusions, develop and describe solutions and recognize their applications.

PO 1. List the quantitative components found in word problems.

PO 2. Provide rationale for classifying objects according to observable attributes (color, size, shape, weight, etc.).